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Consumption Patterns Among Aging Canadians: A Synthetic Cohort Approach

by Amélie Lafrance and Sébastien LaRochelle-Côté

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.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p}	preliminary
^{r}	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
E	use with caution
F	too unreliable to be published

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Abstract

Studies of pre- and post-retirement annual income have focused on the extent to which income falls at this crucial stage in life. Although these studies vary in scope and intent, the overall consensus is that the Canadian retirement income system provides income replacement rates that are in the excess of 60% to 70% for a plurality of Canadians, especially for those who had low incomes during their prime working years. However, little has been published on the extent to which retirees maintain their same levels of consumption. Using data from the Survey of Family Expenditures (FAMEX) and from the Survey of Household Spending (SHS), this study develops a synthetic cohort approach to determine how the consumption patterns of households headed by individuals in their late 40s (in the early 1980s) differ from those of a group of households headed by individuals in their early 70s (in the late 2000s). It finds that, even though the nature of consumption changes over time, the overall levels of consumption "per adult" do not decline by substantial amounts among Canadians as they age.

Executive summary

In recent months, the well-being of Canadian retirees became a policy issue of significant importance. Although the recent financial meltdown played a part in this increased attention, additional problems also contributed to a renewed debate about the financial adequacy of the position of Canadian retirees. These problems include the extent to which younger Canadians are sufficiently prepared for retirement, the sustainability of private and public pension regimes, the ongoing decline of the workers-retirees ratio, as well as an array of issues related to population aging. These concerns were recently highlighted by Mintz (2009) and have been accompanied by a series of reports focusing on the Canadian income security system.

This paper examines the evolution of expenditures and consumption patterns over time for a cohort of households whose head was in his or her late 40s at the beginning of the 1980s. Synthetic groups of individuals deemed 'representative' of that group were constructed by using later cross-section versions of the Survey of Family Expenditures (FAMEX) and of the Survey of Household Spending (SHS). Consumption and expenditures were then examined over five key points of the life cycle of a cohort of aging Canadians.

When examined on a total, unadjusted, basis, both household expenditure and consumption declined over the period, although they did not fall as much as total income. However, this drop might be due to households having lower needs as the number of household members declined from 3.4 to 1.7 on average over that period for the cohort followed in this study.

To take the effect of declining household size into account, results were also expressed on a "per-adult equivalent" basis. On the basis of that approach, expenditure also fell, but by much smaller amounts. Consumption, on the other hand, remained relatively stable as households headed by individuals in their early 70s in the late 2000s consumed 95% of the amount consumed by those in their late 40s exactly 26 years earlier. This compared to an 85% replacement rate in total income "per adult" in a definition of income that includes flows derived from housing services.

Although consumption varied little over time—at least on a per-adult basis—the composition of consumption did change. For older households in their 70s, a larger share of consumption was devoted to housing and a smaller share was spent on food, clothing, and care (primarily because of lower expenditure on food and clothing). Although the consumption of health-related goods and services increased, it was still very modest on average.

Finally, in contrast to income dispersion, consumption dispersion did not vary by substantial amounts over the period among households (consumption dispersion consistently averaged around 30% from the mean, compared to between 40% and 55% for income dispersion). However, the source of the variance did change over time as the source of total variance became characterized mostly by variations in the consumption of housing across households, and characterized much less by variations in the consumption of food, clothing, and care.

1 Introduction

The well-being of Canadian retirees has recently become a policy issue of significant importance. Although the recent financial meltdown played a part in this increased attention, additional problems also contributed to a renewed debate about the financial adequacy of the position of Canadian retirees. These problems include the extent to which younger Canadians are sufficiently prepared for retirement, the sustainability of private and public pension regimes, the ongoing decline of the workers-retirees ratio, as well as an array of issues related to population aging. These concerns were recently highlighted by Mintz (2009) and have been accompanied by a series of reports focusing on the Canadian income security system.

Financial adequacy has been the focus of many of these discussions. More particularly, a number of studies have examined the extent to which income is "replaced" during the retirement years by various cohorts of retirees. For instance, LaRochelle-Côté, Myles, and Picot (2010) found that the Canadian system is achieving relatively high "replacement rates"—especially among those located at the bottom of the income distribution—at least compared to the more pessimistic predictions of the 1970s and 1980s.[1] Similar conclusions were arrived at by studies focusing on more specific populations, including: those who were strongly attached to the labour market in their prime working years (LaRochelle-Côté, Myles, and Picot 2008; Denton, Finnie, and Spencer 2009); those who did or did not contribute to a Registered Pension Plan in their prime working years (Schellenberg and Ostrovsky 2009); and those who experienced a change in their family status (LaRochelle-Côté, Myles, and Picot, forthcoming). Furthermore, other studies have focused on non-standard measures of income, such as housing equity and other assets, and found them to be important contributors to the well-being of retirees (Brown, Hou, and Lafrance 2010).

Income is an important factor in senior well-being but, on its own, does not paint a full picture of it. Another potentially important aspect is consumption, and the extent to which consumption relates to income. However, little is known about the evolution of consumption patterns among retirees, at least in Canada. Many studies published on consumption patterns over time among retirees do so within a cross-sectional context (Chawla 2005). Because they provide a snapshot of retirees at a point in time rather than focusing on the evolution of consumption over time, such studies cannot tell whether changes in consumption are due to changing preferences and tastes, or due to characteristics that are known to vary across cohorts.

This lack of information is due, at least in part, to data gaps. For years, income information has been collected by a number of administrative and survey data sources—the Survey of Labour and Income Dynamics, the Census of Population, the Longitudinal Administrative Database, and the T1 Family File. Consumption information, on the other hand, is more fragmented—especially before the introduction of the modern-era Survey of Household Spending (SHS), in 1997—and information in this area has always been collected on a cross-sectional basis. This has limited the potential for a cohort analysis of consumption patterns over time.

A synthetic cohort approach is used in this paper in order to gather information on the evolution of consumption patterns among seniors as they age. A synthetic cohort is a method whereby people aged, for example, 70 in a survey collected in 2010, are deemed 'representative' of individuals aged 40 in a similarly designed survey in 1980—that is, exactly 30 years earlier. The use of synthetic cohorts is not perfect as it does not account for potential differences between the synthetic cohort and the cohort of origin. Changes in the share of the immigrant population over time, for instance, could be a source of potential bias. Fortunately, information about what

1. See Perrin (1969) and Government of Canada (1980).

is perhaps the single most important characteristic of aging households—household size—has been collected and is widely used in the methodology employed in this paper.

The primary objective of this paper is to compare the consumption (and expenditures) of households headed by individuals who were in their late 40s in the early 1980s to those of other groups of households in later surveys that correspond to that cohort, and to examine the evolution of their consumption patterns and the relationship of their consumption to changing income levels. Four other comparison points are examined, for a total of five points in time: those in their mid-50s in the early 1990s; those in their early 60s in the late 1990s; those in their late 60s in the early 2000s; and those in their early 70s in the late 2000s. The second major objective of the paper is to examine whether consumption patterns are changing over time as households age, since older households might be characterized by a different set of consumption needs. Finally, the paper also examines whether consumption levels become more or less "dispersed," or unequal, among Canadian households as they age, at least in comparison with income dispersion measures. Some discussion of the theoretical background underpinning the issue of life cycle consumption is first required.

2 Background

The issue of consumption over the life cycle has long attracted the interest of economic theorists and analysts. The life-cycle model (LCM), first introduced by Modigliani and Brumberg (1954) and later discussed by Friedman (1957), uses a framework which assumes that individuals choose a consumption path to maximize lifetime utility, determined by a "lifetime budget constraint." The model suggests that consumption patterns should be relatively constant over time, or 'smoothed' over the life cycle—including over the retirement period. Although alterations and revisions to the LCM[2] have been proposed, the basic framework used by Modigliani and Brumberg (1954) and by Friedman (1957) still provides the basic paradigm to inform the discussion of empirical results.

With the development of modern consumption data, most notably with the development of the U.S. Consumer Expenditure Survey, many empirical papers have tested this theory by examining whether retired individuals maintain their spending over their retirement years. The general conclusions that can be drawn from these studies, however, are not clear. The first study (Hamermesh 1984) examined the spending patterns of older couples by using longitudinal data from an administrative data source. Contrary to what was expected from the LCM, this study found that consumption *fell* in the years following retirement—a situation that became widely referred to as the "retirement consumption puzzle." Hamermesh came to the conclusion that U.S. households were not saving enough to maintain their living standards, and that Social Security payments were insufficient to cover the loss in well-being implied by falling incomes at the time of retirement. Because it found such a close association between falling incomes and consumption, the Hamermesh study had a significant impact because it called into question whether the LCM developed by Modigliani and Brumberg (1954) was appropriate to describe the real world. Since then, many other empirical studies have come to similar conclusions, even with panel (or pseudo-panel) data (Banks, Blundell, and Tanner 1998; Bernheim, Skinner, and Weinberg 2001; Miniaci, Monfardini, and Weber 2003; Lusardi 1996).

Recently, however, other studies—many based on panel survey data—did not find any evidence of a substantial reduction in consumption patterns among people who had retired. Some of these studies found small declines that were related mostly to food expenditures and/or to other work-related expenses. Others found relatively similar expenditure levels, with changes only in the consumption *mix* (Hurd and Rohwedder 2006; Hurst 2008; Fisher *et al.* 2005; Ulker 2004; Ameriks, Caplin, and Leahy 2002).

For others, the evidence was more mixed; consumption levels fell, but only for some population groups. For example, Smith (2004) found that consumption levels fell sharply among those who did not retire at the time of their choosing, but remained relatively stable among those who retired on a voluntary basis. This raises the possibility that some vulnerable groups might be more at risk than others. Similarly, Hurd and Rohwedder (2006, 2008) did not find significant declines among the population as a whole, but did find significant declines among those with poor health outcomes.[3]

The range of findings in the area of retirement consumption arises partly from differences in methodology.

2. See Browning and Crossley (2001) and also Hurd and Rohwedder (2003) for a discussion of these models.
3. The same authors (Hurd and Rohwedder 2006) also report that some of the decrease in consumption can be accounted for by the substitution of non-market activities for market activities—for example, eating home-cooked meals as opposed to dining out—particularly among lower-income groups.

The first difference arises from what is included in the definition of 'consumption' used in the different studies. For example, often because of data restrictions, some of the above-mentioned studies focus on the consumption of non-durables only, without taking the consumption of durables (e.g., housing, automobiles, and furniture) into account (Banks, Blundell, and Tanner 1998). This matters because the patterns of lifetime consumption vary across spending categories.

Another issue relates to the treatment of the unit of analysis—or how differences in household size in a family unit are taken into account by using equivalence scales to adjust for changes in household size. Many households downsize as they approach the retirement period, partly because children are leaving the family nest. How this is handled in a study matters. A definition of consumption more closely associated with the notion of well-being needs to adjust for the possible economies of scale that can be associated with the consumption of some items, particularly durables (Pendakur 1998; Lise 2001; Fisher *et al.* 2005). However, different assumptions about economies of scale may lead to different results (Ulker 2004). Some caution must therefore be exercised in comparing different studies and interpreting individual results (the choice of an equivalence of scale is discussed in more detail in Section 3).

A third issue relates to the various approaches that can be used to examine the matter of retirement consumption, particularly within a longitudinal framework. Examples of questions include: Which cohorts should be examined?; Which age groups should be examined?; What should be the timeframe?. Many of these choices are data-driven, but choices must also be made so as to ensure a meaningful analysis of changing consumption patterns among aging Canadians.

2.1 Canadian studies

In contrast to the rich debate on retirement consumption in the international literature (mainly U.S.-based), empirical work focusing on retirement consumption patterns has been relatively rare in Canada. Statistics Canada did not conduct an expenditure-based survey on an annual basis until 1996, and has never collected panel data on expenditures. Hence, it is perhaps not by accident that spending patterns are often based on cross-sectional information (Pendakur 1998; Chawla 2005; Chawla and Wannell 2005). For example, Chawla (2005) found that the mean annual consumption level of households headed by individuals aged 65 to 74 was about 70% of the mean annual consumption level of households headed by individuals aged 55 to 64 in 2003. The average consumption level of households headed by individuals aged 75 and over was even lower, amounting to only 50% that of households headed by individuals aged 55 to 64.

One familiar issue with cross-sectional estimates is that they ignore potential differences across cohorts, not only in terms of income and other key characteristics, but also in terms of preferences and tastes. To address these problems, other Canadian studies have attempted to develop estimates of consumption patterns through modelling, even in the absence of panel consumption data. For example, Lise (2001) and Denton, Mountain, and Spencer (2002) both developed empirical estimates of consumption over the life cycle by grouping together units of observations from various cross-sectional surveys.[4] More particularly, Lise (2001) used data from both the FAMEX and the SHS to identify cohorts of observations born in a given year. These cohort-observations are then aggregated in a regression format in order to develop what could be described as a typical "consumption path" over time. Controls are added in order to

4. In an earlier study based on Canadian data, Robb and Burbidge (1989) also attempted to develop a life cycle pattern of consumption by pooling cross-section data, but used only three years of data from the FAMEX.

account for potential differences across cohorts, for the purpose of generating more robust consumption estimates across the life cycle.

Contrary to the results from cross-sectional studies, both Lise (2001) and Denton, Mountain, and Spencer (2002) found little evidence of declining consumption patterns over the retirement years. Lise (2001) even noted that the flat consumption seen after age 50 is in "stark contrast" to the fall in disposable income seen around age 45 (p. 13). This finding gives credence to the traditional LCM. Similarly, Denton, Mountain, and Spencer (2002) did not find any evidence of substantial changes in consumption patterns during retirement, but found consumption levels to be more responsive when income levels fall, after the age of 65. By and large, these studies appear to be in line with more recent U.S. studies that find little change in consumption patterns as individuals move into retirement.

In this paper, we identify a specific, easily identifiable, cohort of households headed by individuals who moved into their retirement years in the 1990s and 2000s, and examine their consumption patterns by using a synthetic cohort approach. This is different from a life-course approach, which groups individuals of a given age by collapsing observations from consumption surveys conducted at different points in time. The focus on just one cohort provides an alternative that, while selective, expands the evidence on longitudinal consumption patterns. As studies of replacement rates have shown (LaRochelle-Côté, Myles, and Picot 2010), differences across cohorts are potentially important; recent cohorts have generally done better than previous ones. With the ongoing development of the SHS, it is now possible to identify a synthetic cohort of households that can be followed across more than 25 years. This paper also differs from life-course studies in that it provides an examination of consumption in relation to income and a discussion of consumption and income dispersion among Canadians as they age. The approach followed in this paper is described in the next section.

3 Data and methods

3.1 Data sources

Within Statistics Canada, the main source of consumption information among Canadian households is the Survey of Household Spending (SHS). This survey contains detailed information on household income and expenditures in a given year. It has been conducted on an annual basis since 1997; 2008 is the most recent year of available data. Before 1997, consumption information came from another survey: the Survey of Family Expenditures (FAMEX). The FAMEX has the advantage of being comparable to the SHS in a number of ways.[5]

One key difference is that the FAMEX was not conducted in every year. The first "modern-era" FAMEX was conducted in 1978 across Canada. Before its replacement with the SHS in 1997, it was conducted again in 1982, 1986, 1992, and 1996. It was also conducted in 1984 and 1990, but only in the 15 largest metropolitan areas of the country.

Both the FAMEX and the SHS gather information at the household level, not at the individual level. The household "spending unit" is defined "as a group of persons dependent on a common or pooled income for major expenses and living in the same dwelling, or one financially independent individual living alone" (Chawla 2005, page 24). While the unit of analysis is the

5. The FAMEX asked more detailed questions about consumption patterns, but the SHS has a larger sample size than does the FAMEX. The SHS and the FAMEX also differ somewhat in their weighting factors and in survey treatment methods, but similarly defined consumption categories can be obtained at the aggregated level with both surveys.

household, the data can be organized around the age of the reference person. All results must therefore be interpreted as consumption levels obtained by households headed by a person of a given age.

One problem often encountered with synthetic cohorts is the small sample size of surveys for a given age group. In this study, this issue is addressed in two different ways. First, for each of the five strategic "points in time" identified above, two survey years are combined in order to maximize the sample size. Hence, the FAMEX observations collected in 1982 and 1984 are combined, as well as observations collected in the 1990 and 1992 FAMEX. Data from the 1997 and 1998 SHS, the 2002 and 2003 SHS, and the 2007 and 2008 SHS were also merged. (The combined surveys were only two years apart in order to limit differences in consumption due to age differences, and were organized in such a way as to ensure that FAMEX data did not merge with SHS data).

Second, instead of focusing only on people aged, for example, 42 in 1982 and those aged 44 in 1984, a group of individuals around that age is examined in order to increase the sample size (i.e., those aged 45 to 48), as differences in consumption patterns among those who have only a 2−3 year difference in age are likely to be quite small. With this sampling strategy, five strategic stages of an aging 'cohort' will form the basis of this study: the late 40s; the mid-50s; the early 60s; the late 60s; and the early 70s.[6] The result is a sample of 750 to approximately 1,500 observations for each of the five points examined (Table 1):

Table 1
Sample characteristics

	Age		Sample size	Total sample
	From	To		
		number		
Early seventies				
SHS 2008	71	74	481	...
SHS 2007	70	73	608	1,089
Late sixties				
SHS 2003	66	69	751	...
SHS 2002	65	68	665	1,416
Early sixties				
SHS 1998	61	64	760	...
SHS 1997	60	63	845	1,605
Mid-fifties				
FAMEX 1990	53	56	235	...
FAMEX 1992	55	58	515	750
Late forties				
FAMEX 1982	45	48	634	...
FAMEX 1984	47	50	285	919

Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

The use of synthetic cohorts is not devoid of problems. The first problem is attrition. In other words, some individuals in their late 40s could die or leave the country by the time they reach the early 70s, which might introduce a bias in the estimates. Little can be done about this problem, but the reader will notice that the age groups were deliberately chosen so as to minimize this problem, since attrition becomes a major issue mainly after the age of 75, not

6. The 1984 and 1990 surveys were conducted only in 15 major cities. To construct a nationally representative sample for all pairs of years, the weights for respondents in each survey were divided by two except for respondents living outside the 15 cities in 1982 and 1992.

before. The second problem lies in the 'representativeness' assumption, as individuals in their early 70s in the 2007–2008 SHS might not be entirely representative of individuals taken out of the 1982–1984 FAMEX in their late 40s—because of immigration patterns, for example. Again, little can be done about this as both the SHS and FAMEX provide a limited number of socio-demographic variables. However, readers will find a discussion of some key characteristics in Appendix A so that they can assess the comparability of the data.

The cohort being studied here represents households headed by an individual born in the inter-war period, from 1932 to 1937. This cohort precedes the baby boom generation and entered the labour force likely post-WWII, between 1948 and 1957. As such, these households spent their working lives during the post-war boom and saw increases in their relative incomes as compared with previous generations. This era more readily facilitated the accumulation of assets such as investments and housing assets. This cohort also saw a transformation of the household as women entered the workforce, and thus households benefited from a second source of income. However, since comparisons with a younger cohort of individuals yielded very similar results,[7] this paper will therefore focus on results for the cohort described in Table 1 above.

3.2 Expenditures, consumption, and income

Although expenditure and consumption are often used interchangeably, they are two separate concepts. In the *System of National Accounts 1993* (Inter-Secretariat Working Group on National Accounts 1993), a *consumption good or service* is defined as a good or service that is used by households. *Consumption* is defined as spending on all goods and services (food, shelter, automobiles, etc.) benefiting one or several members of the household.

Consumption items are often divided into expenditures on nondurable goods and expenditures on durables goods. Nondurable goods include items that are immediately consumed and usually require a one-time outlay. Durable goods, on the other hand, can provide a flow of services to the household over time. As a result of the complexity of accounting for durable goods, they are often ignored in the literature on consumption patterns. The methodology for the treatment of durable goods in this paper is discussed below.

Expenditures encompass these consumption goods or services, along with other forms of spending for any purpose. In this paper, total expenditures include consumption itself plus gifts, "personal security" items, and taxes paid to all levels of government.[8] *Gifts* are defined as expenditures on persons outside the spending unit, including monetary gifts, and contributions to charitable or religious organizations. Personal security items include life insurance premiums, annuity contracts, employment insurance payments, and retirement and pension fund

7. More precisely, results obtained for the first four "timelines" described in Table 1 were compared to the following samples: households aged 45 to 48 and 47 to 50 in the 1984 and 1986 FAMEX (late 40s); those aged 51 to 54 and 53 to 56 in the 1990 and 1992 FAMEX (mid-50s); those aged 60 to 63 and 61 to 64 in the 1999 and 2000 SHS (early 60s); and those aged 65 to 68 and 66 to 69 in the 2004 and 2005 SHS (late 60s). Although no data are currently available to generate a group of households in their early seventies for this cohort, the first four timelines provide a reasonable basis for comparisons, as most changes are taking place among households in their 60s.
8. The Canadian System of National Accounts (CSNA) does not distinguish between expenditures and consumption. As a result, gifts and contributions are reported in the persons and unincorporated business sector as expenditures. Furthermore, contributions to personal security items are treated as household income items. In the FAMEX and the SHS, households report these contributions separately from income. As a result, this paper provides estimates of consumption and income that are lower than the estimates reported in the CSNA.

payments. Gifts, personal security items, and taxes are items that are not consumed, since they cannot be bought or sold on the market.[9]

Income before taxes in the FAMEX and the SHS comprises wages and salaries, income from self-employment, government transfer payments (e.g., family allowances, employment insurance, government pensions), and miscellaneous income[10] (e.g., income from retirement pensions, Registered Retirement Income Funds (RRIFs), and purchased annuities). The income structure of the cohort is presented in Appendix A.

3.3 Treatment of durables

One issue often encountered in consumption studies is the treatment of some of the durable goods—particularly transportation (automobiles) and houses, two of the most expensive consumption items—although there are few occurrences within the context of an annual survey. One approach is to 'smooth' the consumption of these durables by calculating a value of 'imputed' consumption. This method is generally thought to be more closely associated with well-being simply because expenditures typically seen as more 'lumpy' are smoothed out (Pendakur 1998). Imputed consumption expenditures are computed for two categories of durable goods: housing expenditures (among homeowners) and vehicles.

3.4 Housing

Here, estimates of housing consumption are developed in order to 'smooth' the consumption of housing over a long period of time. It is particularly important to do this within the context of an aging cohort, since younger households are more likely than older households to spend more on the principal and interest of a mortgage, although they presumably derive the same utility from their housing over time.

However, it is also important to estimate housing consumption patterns for two other reasons. The first reason is that spending information on mortgage principal and interests has been collected in different ways in the FAMEX and in the SHS; this raises important conceptual problems in developing comparable estimates of housing expenditures between the two surveys (Statistics Canada 2000).[11] The second reason is more practical: dividing the samples between homeowners and renters would yield samples that are too small, especially for renters, who constitute only a minority, even among older households (see Appendix A). A method was therefore needed to put homeowners and renters on an equal footing when it comes to housing expenditures.

One commonly used approach is to compute 'imputed rents' for home owners.[12] This can be done by estimating a semi-log structure with measures of location and quality of the dwelling (for instance, number of rooms) as independent variables, very much in the spirit of Brown and Lafrance (2010):

$$\ln(rent)_{it} = \alpha + \beta' rooms_{it} + \delta' bathrooms_{it} + \gamma' type_{it} + p_{it} + \varepsilon_{it} \quad (1)$$

9. Sales taxes, including provincial retail sales taxes and the Goods and Services Tax (GST), are included in spending on individual goods and services, and are not included in personal taxes.
10. Contributions to Registered Retirement Savings Plans (RRSPs) are not included.
11. Both the FAMEX and the SHS contain a measure of shelter which includes costs for owned, rented, and other types of accommodation. However, the components of shelter vary from the FAMEX to the SHS, specifically in terms of interest payments for mortgages. Imputation was therefore necessary in order to obtain comparable estimates of housing consumption across both surveys.
12. It was not necessary to impute a housing value for renters, as annual rental expenditures declared by renters in survey data are considered simply as annual housing consumption.

where *rent* is the value of annual serviced rental payments that the renter incurs, which includes utilities (i.e., water, electricity, and fuel). The right-hand side variables measure the quality of the dwelling (i.e., the number of *rooms* and *bathrooms* in the dwelling and the *type* of dwelling), while p takes into account the province in which the dwelling is located. A quadratic term for the number of rooms is also included. The sample here is restricted to those who have rented and occupied their dwelling for 12 months. The model is estimated for each sample.

The predicted values from each model are used to calculate imputed rents for owner-occupied housing. These values include utilities (i.e., water, fuel, and electricity) that would normally be associated with renters, which may not necessarily accord with the utility expenditures of homeowners. The share of utilities as a proportion of rent is calculated for tenants by dwelling type, as expenditures on utilities vary by dwelling type. These shares are then applied to the predicted rents for owner-occupied housing in order to determine the proportion of imputed rents that is accounted for by expenditures on utilities. The difference between these expenditures and actual expenditures on utilities is subtracted from the predicted rental values in order to obtain total shelter costs for homeowners.

Investments in housing generate a source of implicit income for homeowners. Brown and Lafrance (2010) found that, over the period 1969 to 2006, the implicit source of earnings coming from investments in housing increased income for the 60-to-69 age group by 13% on average. This increase was even higher for households headed by individuals aged 70 and over. This implicit income derived from housing services must also be taken into account in this paper. In order to do so, returns to equity on housing need to be estimated. However, this requires estimates of the balance owing on a mortgage. Since this variable is not available in all surveys, the percent increases in income resulting from housing services by year and age group, derived in Brown and Lafrance (2010), are used. Throughout the paper, the measure of household income is thus adjusted in order to account for the flow of housing services enjoyed by homeowners.[13]

3.5 Automobiles

Because most households do not purchase a car every year, the reported consumption of automobiles tends to be 'lumpy' in expenditure data sources. One way to deal with this is to derive an imputed consumption flow for the consumption of purchased transportation vehicles, as suggested in Pendakur (1998). This can be done by estimating a probit model among families with car operation expenses in excess of $100. In this model, the probability of purchasing a car is modelled against a number of variables that are meant to be reflective of a household's financial capacity: family size; net income; net income squared; and a dummy variable indicating the province in which the family's dwelling is located. The predicted probabilities obtained from the probit model are then multiplied by predicted purchase prices obtained from the results of an OLS regression run among car purchasers only.[14] The total consumption flow from transportation is then equal to this imputed car purchase consumption flow plus automobile operation expenses (i.e., gas, batteries, tires) and public transportation expenses.

Overall consumption must therefore be interpreted as the sum of these two imputed values plus the non-imputed value of other durable (such as furniture) and non-durable goods. The result is an overall measure of annual household consumption that should be representative of the

13. Actual housing expenses were also calculated and followed essentially the same path as imputed expenses.
14. Independent variables used for the OLS regression were the same as the ones used for the probit model. Other family characteristics, such as immigration, could also have an impact on predicted probabilities, but the FAMEX and the SHS do not consistently report this information in all years.

actual well-being of household members. All consumption figures have been deflated by using the all-items CPI index and are expressed in 2002 constant dollars.

3.6 Changes in household composition

As noted above, another issue of critical importance addressed in consumption studies is the method used to correct for differences in the size of households. As might be expected, households headed by individuals in their late 40s are typically larger in size (e.g., simply because they have more children residing in the household) than households headed by individuals in their 70s. Hence, many families do reduce (and modify) their spending patterns simply because children are leaving the family nest, not because of a change in consumption preferences or a change in their income constraints. A reduction in consumption due to children leaving the household may have different implications for well-being than changes in consumption patterns that are related to other reasons. Hence, it is important to find a method that accounts for the changing size of families as they age.

One method often used, not only in income studies but also in consumption studies (Pendakur 1998; Lise 2001), is to define an adult-equivalent adjusted (AEA) value of consumption and to deflate household consumption variables by an equivalence scale. Mathematically, this can be expressed as follows:

$$AEA_Consumption = Family_Consumption / Size^{x} \qquad (2)$$

The problem lies in choosing the magnitude of the equivalence scale variable—the size of x as expressed above in equation (2). The value of x determines the degree to which there are economies of scale in households' consumption—that the cost per person falls as the size of the household increases. If the value of x is chosen as 1, then it is assumed that there are no economies of scale in consumption. The larger the size of x is, the smaller are the economies of scale assumed by the equivalence scale. In many studies of income as well as consumption, the equivalence scale most commonly used in the literature is the square root of household size (where x=0.5).

However, as the vast literature of equivalence scale attests,[15] the origins of the square root of household size as the equivalence scale of choice are not always clear and seem to have been a middle-of-the-range choice between equivalence scales used in poverty programs, which tend to place a smaller emphasis on large economies of scale (by way of qualifying a larger number of families with many children as being under a specific poverty line), and survey-based scales, based on either consumption or utility studies, which tend to favour larger economies of scale (see Buhmann *et al.* (1988) for a thorough discussion of equivalence scales). The literature also clearly shows that the choice of the equivalence scale may affect the results when differences in household size are large across comparison groups, for example, between countries or, in the case of this study, across age groups.

One approach would be to ignore the issue and simply present total family consumption figures, regardless of household size. However, this could yield results that are influenced mostly by changes in household dynamics, not by changing preferences or by changes in well-being. Another approach would be to use the square root of income, simply because it is a prevalent method in both the consumption literature and the income literature. A third approach would be to present results on a *per capita* basis (x=1)—but this would be tantamount to assuming that no

15. See Nelson (1993), Buhmann *et al.* (1988), Phipps and Garner (1994), and Smeeding and Rainwater (2004) as primary examples of this literature.

economies of scale can be achieved with consumption items among household members, a rather improbable assumption (especially in view of the fact that most seniors, including widows and widowers, remain living in their homes as they age and continue to face housing and transportation expenses that are not declining linearly with household size[16]).

A prudent approach is therefore used in this paper, by presenting both the results based on total household consumption and the results based on the square root of household size, in order to get a "per-adult equivalent" measure of consumption. Even though the use of the square root of household size appears to be quite standard in the literature, a series of robustness checks are also conducted on the results by using an alternative method to account for changes in the size of the family. Results are shown in Appendix B.

4 Expenditures, consumption, and income over the life cycle

As discussed above, expenditure and consumption are two separate concepts. Expenditures include all spending for any purpose, and include gifts, "personal security" items (such as pensions or insurance premiums), taxes paid to all levels of government, and consumption itself. Consumption is a sub-item of expenditures and can be defined as spending on all goods and services (food, shelter, automobiles, etc.) benefiting one or several members of the household that can be bought or sold on the market. In this section, the relative contribution of each expenditure item to total household expenditure numbers is examined, along with the evolution of this contribution over the life cycle.[17]

Table 2 shows the evolution of major expenditure items for each of the five points in time identified in the previous section, along with average household income figures (after tax and adjusted for returns to housing equity). Both unadjusted results (without adjustments for family size) and numbers per adult are shown.[18] All figures are expressed in 2002 constant dollars.

16. See Hou (2010) for details.
17. Averages were preferred to other measures of central tendency in order to show the contribution of every expenditure item to the total.
18. It is recognized that the square root rule is appropriate for average bundles, and thus tests for robustness of the results are presented in Appendix B.

Table 2
Evolution of expenditures of Canadians

	Late forties	Mid-fifties	Early sixties	Late sixties	Early seventies	Difference [1]
			2002 constant dollars			
Total household expenditure	64,700	62,100	48,600 *	44,900 *	40,800 *	-23,900
Consumption	47,500	42,500 *	35,600 *	34,200 *	33,000 *	-14,500
Personal security	3,100	3,500	1,900 *	1,200 *	900 *	-2,200
Gifts	1,700	2,400	1,400	2,400	1,600	-100
Taxes	12,400	13,700	9,600 *	7,200 *	5,300 *	-7,100
Total household income (after tax)[2]	58,200	55,400 *	43,700	39,400	36,700	-21,500
Per-adult expenditure	36,600	40,000 *	33,600	32,400 *	31,100 *	-5,500
Consumption	26,700	27,300	24,800 *	24,900 *	25,300	-1,400
Personal security	1,700	2,200 *	1,300 *	800 *	700 *	-1,000
Gifts	1,100	1,600 *	1,000	1,800	1,300	200
Taxes	7,100	8,800 *	6,600	5,100 *	3,900 *	-3,200
Per-adult income (after tax)[2]	32,700	35,400	30,000 *	28,400 *	27,500 *	-5,200

* Statistically different from the late-40s group at the 5% level of significance. Significance testing was done by using bootstrap weights for the SHS samples, and by using a jackknife procedure for the FAMEX sample because bootstrap weights are not available in the FAMEX.

1. Difference (in dollars) between households in their early 70s and households in their late 40s. Numbers may not always add up as a result of rounding.
2. Including income flows from housing services.

Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

Average expenditure patterns for all families, regardless of size, are shown in the first panel. When households were in their late 40s, they spent $64,700 on average. Nearly three out of four dollars were spent on consumption ($47,500). Taxes paid were the second most important expenditure item among these households: they spent $12,400 on average in taxes. This represents almost one in five expenditure dollars. Expenditures on personal security ($3,100) and gifts ($1,700) represented just 7% of total expenditures.

Total expenditures, however, progressively declined as people aged, especially between the mid-50s and the early 60s. Expenditures declined by almost $15,000 over that period, and again by almost $8,000 between the early 60s and the early 70s. Most of these declines were due to declining consumption, as it represented $14,500, or 61%, of the entire decline in total household expenditure between the late 40s and the early 70s. As a share of total expenditure items, consumption therefore became even more important for older individuals.

The other source of declining expenditures was a decline in taxes paid. Households paid fewer taxes in their early 70s than in their late 40s ($-7,100), because their income levels also declined over the period (the issue of declining income is discussed later in this section). Expenses on personal security also declined by about $2,200, as pension and social security contributions are typically much lower for older individuals. Expenditures on gifts did not vary over the period.

As discussed above, larger families typically achieve economies of scale with a number of consumption items. Controlling for changes in family size is therefore important, since families become smaller as they age. Between the late 40s and the early 70s, the average household size declined from 3.4 to 1.7 among the cohort of aging households used in this study, while the proportion of households with just one member increased from 12% to 30%. It is thus important to neutralize these differences by developing "per-adult equivalent" figures for expenditure and income. This is done by dividing all items by the square root of the household size, hence transforming expenditure and income figures into equivalent individual expenditure and income items. Results are shown in the second panel of Table 2.

As might be expected, expenditures per adult followed a much different path than the unadjusted figures. First, expenditure levels increased among households between their late

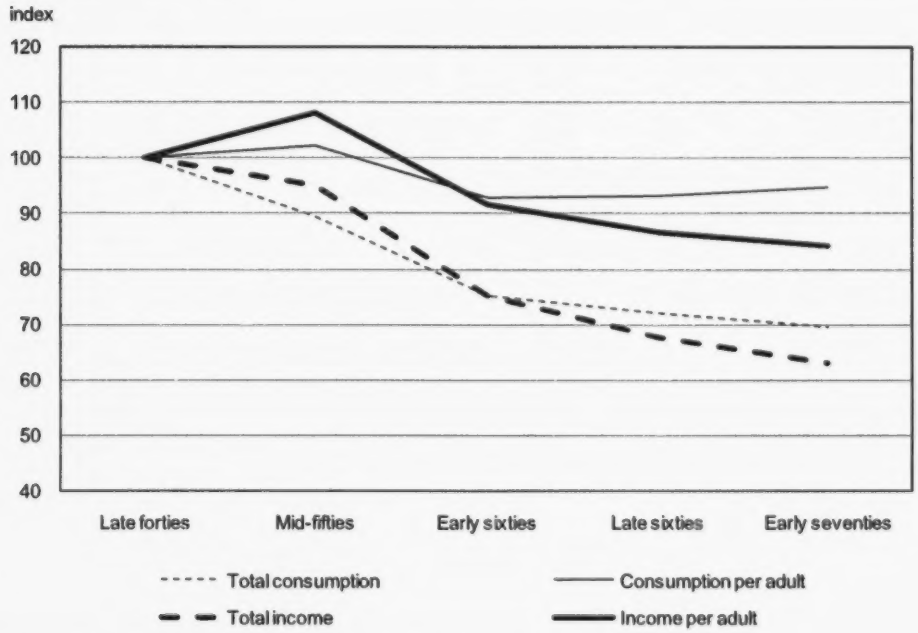
40s and their mid-50s, from $36,600 to $40,000—but declined to $31,100 in their early 70s, for a total decline of $5,500 on a per-adult basis over the entire period. In percentage terms, this amounted to a 15% decline, compared with a 37% decline in total unadjusted expenditure levels. The decline in expenditures is not as large when the reduction in household size is accounted for.

Furthermore, the levels of consumption per adult did not vary by much over the period, as they averaged about $25,000 over the course of the period. As a result, consumption did not account for a large portion of the reduction in expenditure on a per-adult basis. Rather, taxes accounted for most of the $5,500 decline in expenditure over the period (58%). These results suggest that average consumption levels remain relatively constant among households as they age, at least when they are expressed on a per-adult basis.

4.1 Consumption and income "replacement"

It is also important to examine the evolution of consumption in relation to income changes. Using a different data source, LaRochelle-Côté, Myles, and Picot (2010) found that retired individuals in their early 70s replaced about 80% of the income they had at age 55 (on a per-adult basis). If the second panel of Table 2 is any indication, the synthetic cohort used in this study appears to yield very similar income replacement rates, as average income levels "per adult" declined by about 15% over a similar period of time. However, recall that this definition of income includes income flows from housing services, a wider definition than the definition of income used in LaRochelle-Côté, Myles, and Picot (2010).[19]

Chart 1
Index of consumption and income patterns among senior Canadians (late forties = 100)



Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

19. When housing services are excluded from the definition of household income followed in this paper, the income replacement rates are equal to those provided in LaRochelle-Côté, Myles, and Picot (2010)—that is, about 80%.

When one takes households in their late 40s as a reference point, the results indicate that average total unadjusted household income had declined by almost 25% by the time these households were in their early 60s (Chart 1). Most of that reduction took place between the beginning of their mid-50s and their early 60s, when most individuals retire and begin to collect their pension benefits. Total consumption, however, did not fall as steeply over the period, as households aged 70 and over had consumption levels that amounted to 70% of what they consumed in their late 40s.

When expressed on a per-adult basis, income and consumption followed an even more divergent path, especially after the early 60s. Hence, when they are compared to a younger version of themselves, households headed by individuals aged in their early 70s had income levels that were more than 15% lower, but had consumption levels that were just 5% lower, than those of their younger counterparts. These results therefore support the view that households are 'smoothing out' their consumption over time, in accordance with LCM theories, especially when the results are expressed on a "per-adult" basis. This smoothing of consumption may be the result of households saving early in the life cycle in order to keep consumption constant in the future.

4.2 Consumption-to-income ratios

The relationship between income and consumption over a life cycle can be examined through the use of expenditure-to-income and consumption-to-income ratios. Although not an indicator of financial stress, these ratios provide an indicator of the extent to which annual income (including income from housing services) contributes to financing household expenditures and consumption. A typical life cycle will see households save early in life but consume assets later. Hence, a ratio in excess of 1 among older households is not necessarily atypical, as many older individuals are expected to use their savings to consume past a certain age.[20]

Table 3 shows the ratio of expenditure (minus taxes) to income (after taxes) and the ratio of consumption to income (after taxes). For all households, the median expenditure-to-income ratio was below 1 until the early 60s. Households in their late 40s are saving almost 10 cents for every dollar of their income. Towards the late 60s, households typically spent more than their income, by a small margin of three cents for every dollar.

Income levels were sufficient to cover consumption expenses (as opposed to expenditures) at every point of the period. Nevertheless, the consumption-to-income ratio increased by a significant margin over time, from 0.83 among households aged in their late 40s to 0.96 among households aged 70 and over. (Identical results were found when the same numbers were generated on a "per-adult equivalent" basis).

20. Recall that the definition of household income used in this study has been adjusted in order to consider the flow of income from housing services. As might be expected, older households typically receive more income from housing services than do younger households.

Table 3
After-tax income (including income flows from housing services) and consumption statistics over the life cycle

	Late forties	Mid-fifties	Early sixties	Late sixties	Early seventies
Total household income (after tax) and consumption					
Median expenditure(minus taxes)-to-income ratio	0.915	0.920	0.951	1.028	1.009
Median consumption-to-income ratio	0.833	0.827	0.902	0.975	0.962
Percent of households with income less than consumption	22.300	27.300	37.400	44.800	44.100
Median income gap (dollars)	8,000	7,400	7,000	6,700	7,200
Per-adult income (after tax) and consumption					
Median expenditure(minus taxes)-to-income ratio	0.916	0.921	0.950	1.024	1.008
Median consumption-to-income ratio	0.834	0.827	0.901	0.971	0.961
Percent of households with income less than consumption	22.300	27.300	37.400	44.800	44.100
Median income gap (dollars)	4,700	5,100	5,300	5,000	6,000

Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

Among households aged in their late 40s, almost one-quarter of households had consumption levels that exceeded their income levels. Among these, the median "distance" between their income level and their consumption level was $8,000, indicating that income was not meeting overall consumption levels for a number of households, even among those in their late 40s. This may be due to the run-down of an inheritance, an income shock, or households spending a large portion of their income on durables, such as housing, early in the life cycle.

The proportion of households for whom consumption exceeded income increased over the life cycle, from 27% among those who were aged in their mid-50s, to 44% among those who were aged in their late 60s and in their early 70s. This is as expected, as many seniors rely on accumulated savings to finance their consumption. The typical "income gap" among those who consume more than they earned was in the $7,000-to-$8,000 range throughout most of the period. On a "per-adult equivalent" basis, the income gap varied from $4,700 among households in their late 40s to $6,000 among those in their early 70s.[21]

5 Changes in consumption patterns

Consumption can be broken down into its various components in order to determine how much households spend on particular items and which of these items households have spent less on following retirement. For the purposes of this paper, consumption items have been classified across four categories: residence and properties (comprising all expenditure items related to homeownership, rental, or maintenance); transportation (car and other transportation-related expenditures); food, clothing, and care (including personal care and health care items, but excluding public health care spending); and other consumption items, comprising items that may be less essential for the health, safety, or security of household members.[22]

21. Although this may suggest that older households are financing some of their consumption through debt, readers should keep in mind that older households typically have a higher level of financial and non-financial assets that can be used to finance their consumption.
22. Recall that car and shelter expenditures have been 'smoothed out' in order to avoid the issue of 'lumpy' expenditures over the life cycle as well as to have a consistent definition of *shelter spending* across renters and homeowners alike (see section 3).

Table 4
Detailed consumption patterns over the life cycle, total household consumption

	Late forties	Mid-fifties	Early sixties	Late sixties	Early seventies	Difference [1]
			2002 constant dollars			
Residence and properties	14,200	14,000	14,000	13,000 *	14,000	-200
Shelter	8,400	9,200 *	9,700 *	9,100 *	10,200 *	1,800
Other accommodation	900	900	800	600	800 *	-100
Household operations	2,400	2,100 *	2,100 *	2,000 *	1,900 *	-500
Furnishings and equipment	2,500	1,800 *	1,400 *	1,300 *	1,100 *	-1,400
Transportation	7,900	8,100	6,200 *	6,400 *	5,800 *	-2,100
Purchased automobiles	2,700	3,200 *	2,400 *	2,700	2,200 *	-500
Automobile operation	4,400	4,200	3,200 *	3,200 *	3,100 *	-1,300
Public transportation	800	700	600 *	500 *	500 *	-300
Food, clothing, and care	17,000	12,700 *	10,100 *	9,800 *	9,200 *	-7,800
Food	10,000	7,500 *	5,900 *	5,700 *	5,000 *	-5,000
Clothing	4,500	2,900 *	2,000 *	1,700 *	1,500 *	-3,000
Personal care	1,200	1,100	700 *	700 *	700 *	-500
Health	1,300	1,200	1,500 *	1,700 *	2,000 *	700
Other	8,500	7,500	5,500 *	5,000 *	4,000 *	-4,500
Recreation	3,200	2,900	2,500 *	2,500 *	2,000 *	-1,200
Reading and printed materials	400	300	300	300	200 *	-200
Tobacco and alcohol	2,200	1,800	1,100 *	1,100 *	700 *	-1,500
Miscellaneous	2,700	2,500	1,600 *	1,100 *	1,100 *	-1,600
			percent			
Percent of total	100.0	100.0	100.0	100.0	100.0	...
Residence	29.8	33.1	39.1	38.0	42.4	...
Transportation	16.6	19.1	17.3	18.7	17.6	...
Food, clothing, and care	35.7	30.0	28.2	28.7	27.9	...
Other	17.9	17.7	15.4	14.6	12.1	...

* Statistically different from the late-40s group at the 5% level of significance. Significance testing was done by using bootstrap weights for the SHS samples, and by using a jackknife procedure for the FAMEX sample because bootstrap weights are not available in the FAMEX.

1. Difference (in dollars) between households in their early 70s and households in their late 40s. Numbers may not always add up as a result of rounding.

Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

We begin by discussing detailed consumption patterns without any adjustment to account for changes in family size (Table 4). Among households in their late 40s, the largest consumption category was that of food, clothing, and care, which averaged $17,000. Within that category, the two most important items were expenses on food and expenses on clothing (representing about 85% of the $17,000). The second most significant consumption category was that of residence and properties, which amounted to almost $14,000 on average—mostly as a result of shelter costs, which averaged nearly $8,400 a year. The two categories residence and properties and food, clothing, and care therefore accounted for two-thirds of the total consumption of households in their late 40s. Transportation and "other" items accounted for 17% and 18% of consumption spending among these households, respectively.

Over the 25-year period, however, consumption patterns changed. First, the consumption of food, clothing, and care decreased by a substantial degree, mainly as a result of declines in food and clothing spending. In fact, households in their early 70s had almost half the average level of consumption of these items by households in their late 40s. By the early 70s, food, clothing, and care items accounted for 28% of total consumption, down from 36% for households in their late 40s. Consumption of "other" items (including spending on leisure activities) also declined by a significant amount ($-4,500), with reductions in all categories. In all, food, clothing, and care and "other" items represented nearly 85% of the reduction in total

household consumption over the period within the cohort followed in this study.[23] One exception, however, is health, which increased by $700 over the period, presumably because older individuals are more likely to deal with medical issues.

By contrast, consumption of residence and properties remained relatively constant over the period. That housing-related consumption remained constant over the period does not necessarily come as a surprise, as recent research indicated that a high proportion of older individuals continue living in their homes as they age (Hou 2010).

Spending on transportation declined by about $2,000. While many older individuals retain a car after retirement, as shown by the relatively minor decline in the amount dedicated to car expenditures ($-500), spending on automobile operation is not as high ($-1,300). This is perhaps due to lower car usage following retirement.

When consumption levels are adjusted in order to account for household size (Table 5), spending on items that come under food, clothing, and care (excluding health spending) and "other" also drop, although this decrease is of a smaller magnitude. Furthermore, the value of the consumption of shelter increased over the period, while spending on transportation remained quite constant. On a "per-adult equivalent" basis, this suggests that spending on shelter increases over the life cycle. This result is not unexpected, as older individuals tend to continue living in their homes even when children are leaving the family nest. This raises the cost of shelter on a "per adult" basis. The other implication is that, although total consumption patterns remain relatively constant on a per-adult basis, the patterns of consumption do change, as housing expenditures take on a larger portion of consumption. The decline in food and clothing items, however, becomes much smaller compared to total household figures. (Readers should note that spending on recreation also becomes much more stable when numbers are expressed on a "per-adult equivalent" basis.)

23. As suggested by some U.S. studies, this decline may be due to a decrease in work-related expenses. However, the SHS and FAMEX do not clearly distinguish between work-related and non-work-related expenses.

Table 5
Detailed consumption patterns over the life cycle, per-adult equivalent

	Late forties	Mid-fifties	Early sixties	Late sixties	Early seventies	Difference [1]
			2002 constant dollars			
Residence and properties	8,200	9,300 *	9,900 *	9,600 *	10,900 *	2,700
Shelter	4,900	6,200 *	7,000 *	6,900 *	8,000 *	3,100
Other accommodation	500	600	500	400	600	100
Household operations	1,400	1,300	1,400	1,400	1,500	100
Furnishings and equipment	1,400	1,200	1,000 *	900 *	800 *	-600
Transportation	4,400	5,300 *	4,300	4,600	4,400	0
Purchased automobiles	1,500	2,100 *	1,700 *	2,000 *	1,700 *	200
Automobile operation	2,400	2,700	2,200 *	2,200	2,300	-100
Public transportation	500	500	400	400	400	-100
Food, clothing, and care	9,300	8,100 *	7,000 *	7,000 *	7,000 *	-2,300
Food	5,500	4,800 *	4,000 *	4,100 *	3,800 *	-1,700
Clothing	2,400	1,800 *	1,400 *	1,200 *	1,100 *	-1,300
Personal care	700	700	500 *	500 *	600 *	-100
Health	700	800	1,100 *	1,200 *	1,500 *	800
Other	4,800	4,800	3,800 *	3,600 *	3,100 *	-1,700
Recreation	1,800	1,800	1,700	1,800	1,500	-300
Reading and printed materials	200	200	200	200	200	0
Tobacco and alcohol	1,300	1,200	800 *	800 *	600 *	-700
Miscellaneous	1,500	1,600	1,100 *	800 *	800 *	-700
			percent			
Percent of total	100.0	100.0	100.0	100.0	100.0	...
Residence	30.7	33.8	39.6	38.7	42.9	...
Transportation	16.5	19.3	17.2	18.5	17.3	...
Food, clothing, and care	34.8	29.5	28.0	28.2	27.6	...
Other	18.0	17.5	15.2	14.5	12.2	...

* Statistically different from the late-40s group at the 5% level of significance. Significance testing was done by using bootstrap weights for the SHS samples, and by using a jackknife procedure for the FAMEX sample because bootstrap weights are not available in the FAMEX.

1. Difference (in dollars) between households in their early 70s and households in their late 40s. Numbers may not always add up as a result of rounding.

Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

5.1 Health-related spending

As noted above, health-related expenditures were the only consumption items that saw an increase over the 20-year period. Households in their early 70s spent $700 more than households in their late 40s on health-related items. Since this is a cohort of aging Canadians, it is useful to examine the sources of that increase in more detail.

As Table 6 indicates, most of the increase in health expenditures over the period was due to increased spending on medicines and pharmaceuticals ($400). Health care supplies and services also contributed to the increase, but to a lesser degree ($300). Similar results were found when expressed on a per-adult basis. As a proportion of total consumption, health expenditures increased from 3% to 6% over the period—but, obviously, consumption of health items did not represent the majority of consumption among older households.

Table 6
Health-related spending

	Late forties	Mid-fifties	Early sixties	Late sixties	Early seventies	Difference [1]
			dollars			
Total health spending	1,300	1,200	1,500 *	1,700 *	2,000 *	700
Medicines and pharmaceuticals	200	300	500 *	600	600 *	400
Eye and dental care	500	400	400	400	500	0
Health care supplies and services	100	100	200	200	400 *	300
Insurance premiums	400	400	400	500	500	100
			percent			
Percent of total consumption	2.7	2.9	4.2	4.9	6.0	3.3
			dollars			
Health spending per adult	700	800	1,100 *	1,200 *	1,500 *	800
Medicines and pharmaceuticals	100	200 *	400 *	400 *	500 *	400
Eye and dental care	300	300	300	300	400 *	100
Health care supplies and services	100	100	100	100	300 *	200
Insurance premiums	300	200	300	400 *	400 *	100
			percent			
Percent of total consumption	2.7	2.9	4.3	4.9	6.1	3.4

* Statistically different from the late-40s group at the 5% level of significance. Significance testing was done by using bootstrap weights for the SHS samples, and by using a jackknife procedure for the FAMEX sample because bootstrap weights are not available in the FAMEX.

1. Difference (in dollars) between households in their early 70s and households in their late 40s. Numbers may not always add up as a result of rounding.

Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

6 Dispersion measures

Until this point, this study has concentrated on reporting average expenditure, income, and consumption patterns among a cohort of aging households. Looking at averages, however, provides little information about the dispersion of consumption around the "typical" household at every point of the cohort. Dispersion measures show the degree to which changes in consumption are due to changes at the top end or the bottom end of the distribution. While past studies have focused on income dispersion (LaRochelle-Côté, Myles, and Picot 2008), little is known on the dispersion in consumption. Examining dispersion of consumption may shed light on equality (or inequality) of consumption over time and with age. Looking at measures of dispersion provides another useful test for the LCM. If, as the LCM stipulates, consumption needs remain broadly similar over the life cycle, the dispersion of consumption across individuals should remain more or less the same among individuals as they age.

Table 7
Measures of consumption dispersion

	Late forties	Mid-fifties	Early sixties	Late sixties	Early seventies
Total consumption					
P90 relative to P10 (ratio)	3.1	3.6	3.7	3.3	3.0
P75 relative to P25 (ratio)	1.8	2.0	1.9	1.8	1.8
Mean absolute deviation	0.374	0.407	0.384	0.358	0.345
Consumption per adult					
P90 relative to P10 (ratio)	2.7	2.7	2.9	2.6	2.4
P75 relative to P25 (ratio)	1.6	1.7	1.7	1.6	1.6
Mean absolute deviation	0.313	0.318	0.321	0.281	0.290

Note: 'P' stands for 'percentile'.

Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

Various measures of consumption dispersion, or "inequality," are shown in Table 7, for both total consumption and consumption expressed on a per-adult basis. Three different measures are used. The "P75 / P25" is a ratio of consumption spending made by the household located at the 75th percentile of the consumption distribution, divided by the consumption of the household located at the 25th percentile. The "P90 / P10" is calculated similarly, but by using households located at the 90th and 10th percentiles, respectively. A third measure, the mean absolute deviation (MAD), is the typical deviation, in percentage terms, of a household's consumption from the average consumption level. For instance, if a MAD of 0.2 is found among households in their late 40s, it means that households typically deviated from the mean by 20% during that period.

Interestingly, the dispersion in consumption patterns did not vary much across households as the cohort aged. Taking the mean absolute deviation as an example, consumption patterns typically deviated from the average by a 35%-to-40% margin over the period. Consumption expressed on a per-adult basis also varied little, although the variation levels were relatively smaller, at 30%, throughout all of the period. Other measures of dispersion yielded similar results. On a per-adult basis, households at the 75th percentile had consumption levels that were 1.6 times above those of households at the 25th percentile, and the ratio remained quite stable throughout the period. The P90 / P10 varied from 2.4 to 2.9 over the period.

Table 8
Measures of income dispersion, including income flows from housing services

	Late forties	Mid-fifties	Early sixties	Late sixties	Early seventies
Total income (after taxes)					
P90 relative to P10 (ratio)	4.1	5.8	6.4	5.0	4.2
P75 relative to P25 (ratio)	2.0	2.3	2.5	2.2	2.4
Mean absolute deviation	0.455	0.529	0.554	0.473	0.457
Income per adult (after taxes)					
P90 relative to P10 (ratio)	3.4	4.2	4.9	3.5	3.2
P75 relative to P25 (ratio)	1.9	2.1	2.1	2.0	1.9
Mean absolute deviation	0.400	0.442	0.484	0.385	0.380

Note: 'P' stands for 'percentile'.
Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

In comparison, income dispersion varied much more over the period (Table 8). On a per-adult basis, households in their late 40s typically diverted from the group mean by 40% on average (as opposed to a MAD of 30% in consumption levels). Income dispersion increased to 48% among households in their early 60s, before the stabilizing effect of pension income brought income dispersion back into the 40% range in the late 60s and beyond. Although the P75 / P25 varied less, the P90 / P10 measure also increased among households until their early 60s, and then declined to levels that were initially seen among households in their late 40s. The implication of such results is that income varies typically more than consumption, in accordance with the basic paradigms of the LCM.

Although the consumption variance did not change much among households over the period, the source of that variance might have changed, not least because consumption patterns did change over the period. This assumption is verified by using a simple variance decomposition technique, in which the variance of total consumption is expressed as a weighted sum of the variance of every consumption item plus a series of covariance terms. More formally, if Z is total consumption, then it can also be expressed as a sum of all four major consumption items (represented by the terms X_1 to X_4 in the following equation):

$$Z = c_1X_1 + c_2X_2 + c_3X_3 + c_4X_4 \quad (3)$$

where c_1 to c_4 represent the shares of each consumption item into total consumption.

The variance of total consumption can then be expressed as follows:

$$Var(Z) = c_1^2Var(X_1) + c_2^2Var(X_2) + c_3^2Var(X_3) + c_4^2Var(X_4) + covariance\ terms \quad (4)$$

Table 9 shows the results of the variance decomposition procedure, expressed as a percentage of total variance. Taking households aged in their late 40s as an example, one finds that 11% of the total variance in per-adult consumption came from spending on residence and properties, 15% came from spending on food, clothing, and care, and almost 68% came from the covariance terms.[24] Put differently, this means that 11% of consumption "inequality" came from housing, while 15% came from food, clothing, and care, and nearly 68% came from the covariance items (interestingly, very little of the total variance was due to the variations in the other two spending items—transportation and "other"). Similar results were found with the variance in total household consumption.

Table 9
Decomposition of variance in consumption

	Late forties	Mid-fifties	Early sixties	Late sixties	Early seventies
			percent		
Variance in total consumption	100.0	100.0	100.0	100.0	100.0
Residence and properties	9.8	9.9	23.5	21.4	31.6
Transportation	1.1	2.6	1.0	1.9	1.3
Food, clothing, and care	20.8	14.6	7.6	11.3	8.0
Other	3.7	4.3	2.0	1.9	1.0
Covariance terms	64.6	68.6	66.0	63.5	58.1
Variance in per-adult consumption	100.0	100.0	100.0	100.0	100.0
Residence and properties	10.9	13.5	23.9	25.9	32.1
Transportation	1.0	2.3	0.7	1.8	0.9
Food, clothing, and care	15.4	12.0	6.1	9.8	6.8
Other	4.7	5.0	2.1	2.3	1.0
Covariance terms	67.9	67.2	67.1	60.2	59.2

Note: Numbers may not always add up as a result of rounding.
Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

However, the share of variance attributed to differences in housing spending increased by a substantial margin over the period, while the variance due to differences in spending on "other" items decreased considerably. Among households aged in their early 70s, nearly one-third of total variance could be attributed to variations in housing spending while only 8% was due to variations in spending on food, clothing, and care. The share due to covariance items also declined slightly, from 65% to 58%. This suggests that, even though total variance changed little, the sources of differences in consumption levels across households became different over time. This is also consistent with the fact that spending on housing occupies a larger portion of consumption among older households.

24. Simply put, the covariance terms indicate the extent to which the overall variance is due to sub-components moving together across households.

7 Conclusion

Previous research indicated that Canadians achieved relatively "high" income replacement rates. According to LaRochelle-Côté, Myles, and Picot (2010), individuals typically replace 80% of their family income as they age. However, very little is known about variations in the consumption patterns of aging Canadians over the same period. This paper examines the evolution of expenditure and consumption patterns over time for a cohort of households whose head was in his or her late 40s at the beginning of the 1980s. Synthetic groups of individuals deemed 'representative' of that group were constructed by using later cross-section versions of the Survey of Family Expenditures (FAMEX) and of the Survey of Household Spending (SHS). Consumption and expenditures were then examined over five key points of the life cycle of a cohort of aging Canadians.

When examined on a total, unadjusted, basis, both household expenditure and consumption declined over the period, although they did not fall as much as total income. However, this drop might be due to households having lower needs as the number of household members declined from 3.4 to 1.7 on average over that period for the cohort followed in this study and as most of the change in consumption was related to lower consumption of food, clothing, and care and of "other" items.

To take the effect of declining household size into account, results were also expressed on a "per-adult equivalent" basis. On the basis of that approach, expenditure also fell, but by much smaller amounts. Consumption, on the other hand, remained relatively stable as households headed by individuals in their early 70s in the late 2000s consumed 95% of the amount consumed by those in their late 40s exactly 26 years earlier. This compared to an 85% replacement rate in total income "per adult" in a definition of income that includes flows derived from housing services.

Although consumption varied little over time—at least on a per-adult basis—the composition of consumption did change. For older households in their 70s, a larger share of consumption was devoted to housing, and a smaller share was spent on food, clothing, and care (primarily because of lower expenditure on food and clothing). Although the consumption of health-related goods and services increased, it was still very modest on average.

Finally, in contrast to income dispersion, consumption dispersion did not vary by substantial amounts over the period among households (consumption dispersion consistently averaged around 30% from the mean, compared to between 40% and 55% for income dispersion). However, the source of the variance did vary over time as the source of total variance became mostly characterized by variations in the consumption of housing across households, and much less characterized by variations in the consumption of food, clothing, and care.

Most studies thus far have ignored the issue of the non-divisibility of goods (e.g., housing) and have focused solely on goods that are divisible (e.g., food, clothing, and health-related spending). It is important to account for non-divisible goods. While the issue was not directly addressed in this paper, this study has shown that consumption of such goods increases over the life cycle and that this leads to smoothing of the total bundle of consumption goods over time.

Appendix A: Description of synthetic cohort

As the cohort aged, the regional distribution did not change by much, but some changes were observed in terms of the composition of households, homeownership patterns, and income levels (Table A1).

First, the presence of children in the household was less common among older households. Among households in their late 40s, 64% had children living in their home whereas this proportion fell to 6% by the time households reached the age of 70. At age 70 and over, almost one-half of the sample was made up of couples cohabiting. Moreover, the proportion of unattached individuals increased as the cohort aged, particularly for women. This underscores the need to discuss results obtained on a "per adult" basis in the paper.

Homeownership patterns changed as well, albeit less dramatically than the household family structure. The proportion of households living in single detached homes remained quite stable over time, although the proportion of households living in apartments increased from 15% to 29%. With regard to homeownership rates, the proportion of renters in the sample increased between the late 40s and the early 70s. The proportion of households with a mortgage fell from 42% in the late 40s to less than 11% in the early 70s. This pattern is consistent with the literature on homeownership rates, whereby the proportion of homeowners with a mortgage steadily declines with age (Hou 2010; Brown, Hou, and Lafrance 2010). For this particular cohort, an increase in age and a decrease in the number of family members do not seem to be associated with a tendency to downsize or move to rental accommodation.

Changes were also seen in income structure and income levels over the period. For households in their late 40s, the major source of income tends to be from earnings, such as wages and salaries and self-employment income. However, once households retired (or by the late 60s or early 70s, when most households had retired), most household income was derived from government transfers (including government pensions) and other sources of income, such as private retirement pensions and annuities. Approximately two-thirds of household income among households headed by individuals 70 or over was obtained from these two measures of income.

Over one-half of households in their late 40s were in the upper income level group of over $50,000. This share of households fell to 14% once households reached the age of 70. At this age, a greater proportion of households had an annual income below $35,000. This shift in income is a product of income replacement rates of below 100% after retirement (LaRochelle-Côté, Myles, and Picot 2010).

Data on other characteristics (such as immigration) were not always available, while others (gender of reference person) were simply not usable as a result of changes in the definition of the reference person across surveys.[25]

25. Immigration numbers were verified against Census data, however, by using a similarly defined cohort of individuals. The proportion of immigrants was 24.8% among those aged 45 to 48 in 1981 and rose to 30.6% among those who were aged 70 to 74 in 2006.

Text table 1
Characteristics of the cohort

	Late forties	Mid-fifties	Early sixties	Late sixties	Early seventies
			percent		
Region					
Atlantic provinces	7.6	6.6	8.3	8.1	8.3
Québec	25.5	29.5	25.6	28.2	25.2
Ontario	39.2	40.9	35.8	36.9	38.6
Prairies	15.9	12.2	15.3	13.7	16.0
British Columbia	11.9	9.7	15.1	13.2	12.3
Household type					
Unattached men	6.4	7.9	8.7	8.0	11.9
Unattached women	5.1	9.5	15.9	21.6	27.3
Couples only	10.2	33.3	48.3	52.0	45.1
Couples with children or relatives	64.0	39.2	18.1	10.9	6.2
Lone parents	10.5	5.3	3.6	2.4	3.7
Other mixed households	3.9	4.8	5.5	5.1	6.0
Type of dwelling					
Detached	67.9	66.2	64.9	62.1	57.6
Semi-detached	4.7	2.9	3.4	5.0	4.5
Row house	5.5	3.1	3.7	2.6	3.6
Duplex	4.7	2.9	3.8	3.6	2.3
Apartment	15.0	22.1	21.2	24.8	28.9
Other dwelling type	2.3	2.9	3.0	1.9	3.1
Homeownership					
Renter	25.4	26.5	24.9	26.6	27.6
Owner without mortgage	32.9	51.3	56.3	61.2	61.7
Owner with mortgage	41.8	22.2	18.8	12.3	10.7
Composition of income					
Earnings	87.2	80.0	52.4	28.5	18.9
Investment income	5.9	6.0	6.3	5.9	7.5
Government transfers	5.6	7.6	21.4	40.9	47.2
Other sources	1.3	6.4	20.0	24.7	26.5
Income level					
Under $20,000	7.4	5.5	27.2	31.4	31.8
$20,000 to $34,999	15.8	9.9	31.8	35.7	36.0
$35,000 to $49,999	20.6	12.3	19.9	18.6	17.7
$50,000 or more	56.3	72.4	21.1	14.3	14.4

Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

Appendix B: An alternative method for generating "per-adult equivalent" figures

The results expressed on a "per adult" basis can be verified as follows. First, the same results are recalculated by making the assumption that no economies of scale can be achieved among non-durables (by dividing all consumption of non-durables by the number of individuals in the family). Second, the consumption of durables is deflated by the traditional square root of family size (as no one would contest the argument that no economies of scale can be achieved among household members for items such as housing, furniture, or automobiles). The results are then summed up to yield alternative consumption figures expressed on a "per-adult equivalent" basis.

Text table 2
Detailed consumption patterns over the life cycle, per-adult equivalent

	Late forties	Mid-fifties	Early sixties	Late sixties	Early seventies	Difference [1]
			2002 constant dollars			
Residence and properties	7,600	8,900	9,500	9,300	10,600	3,000
Transportation	3,300	4,200	3,500	3,900	3,700	400
Food, clothing, and care	5,500	5,400	5,000	5,200	5,500	0
Other	2,800	3,000	2,600	2,700	2,400	-400
			percent			
Percent of total	100.0	100.0	100.0	100.0	100.0	100.0
Residence	39.6	41.4	46.1	44.1	47.7	100.0
Transportation	17.2	19.5	17.0	18.5	16.7	13.3
Food, clothing, and care	28.6	25.1	24.3	24.6	24.8	0.0
Others	14.6	14.0	12.6	12.8	10.8	-13.3

1. Difference (in dollars) between households in their early 70s and households in their late 40s. Numbers may not always add up as a result of rounding

Sources: Survey of Family Expenditures (FAMEX) and Survey of Household Spending (SHS).

The alternative method of measuring consumption of residence and properties essentially leads to results that are very similar to those obtained when adjusting for the square root of family size. As a proportion of total consumption, residence and properties makes up almost 50% of the total.

Deflating the consumption of non-durables by the number of individuals in the family results in very little change in the consumption of transportation, food, clothing, and care, and of "other" items for households as they reach their early 70s. As a result, the distributions are similar to those obtained in Section 5.

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